FIELD PEAS IN CANADA

Research Branch

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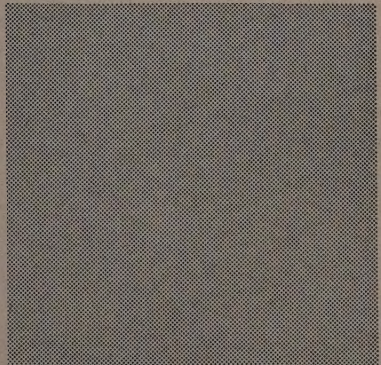

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FIELD PEAS IN CANADA

PRODUCTION, MARKETING AND VARIETIES

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Field peas (*Pisum sativum arvense*) belong to the legume family, which includes a number of other cultivated crops such as alfalfa, clovers, beans, vetches, soybeans, and numerous native wild plants. This family has a characteristic type of flower and pod; it also has compound leaves, and nodules on the roots by which the growing plants are able to obtain some of their nitrogen from the air. Part of this nitrogen is stored in the roots and retained in the soil after root decay and may be used by future crops. This characteristic, together with the cash value of the crop, makes pea-growing well worth while. It is advisable, however, to have confirmed markets for the crop before attempting commercial production.

HISTORY

Peas are thought to have originated in the cooler sections of eastern Europe and western Asia. They can be traced back for thousands of years and were found among relics of the Stone Age in Switzerland and Savoy. Field peas were grown as a common food in Britain as early as the eleventh century.

Peas were introduced into North America by the early explorers. Peter Martyne wrote that Columbus grew peas on Isabella Island in 1493; and Jacques Cartier in 1535 mentioned in his diary that Indians on the island of Hochelaga, now Montreal, grew a crop of peas. French fur traders in 1613 bought peas for their voyages from Indians living in the Ottawa Valley. Peas formed a considerable part of the diet of the early settlers and became one of the most important cash crops grown in Ontario and Quebec.

The census for Lower Canada of 1827 reports a pea production of 823,318 bushels, which incidentally is 137,000 bushels more than that of the entire country in 1955. From 1827 until just before the turn of the century there was a steady increase in acreage and production. The Ontario crop alone reached close to 13 million bushels, much of it being exported to the United States, where the peas were roasted and used as a substitute for coffee. Pure food laws introduced in that country about 1900 curtailed this lucrative trade.

About this time a serious infestation of the pea weevil occurred in several successive years and caused a drastic reduction in acreage in Ontario and Quebec. Control measures available at that time were rather unpleasant to apply and many farmers stopped growing peas.

Tariff restrictions introduced by the United States in 1921 placed such a high import duty on peas that Canadian farmers withdrew from that market.

The relatively high protein content of field peas made the crop a valuable constituent of stock feeds. However, peas declined in importance when by-products high in protein and fat became readily available from the oil-processing and milling industries. More recently the introduction of early-maturing and higher-yielding soybean varieties has further lessened the importance of field peas as an animal feed. At present the field crop is used mainly in the soup trade and to a lesser degree as a soiling crop and animal feed supplement.

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PRODUCTION

The acreage and production of dry, threshed field peas in Canada have been declining for the past half century. It is possible that the all-time low in production was reached in 1950. Tables 1 and 2 indicate that in the last 25 years production was highest in 1956. Since then it has been over the million bushel mark and this production is likely to be maintained.

Recently two thirds of the Canadian crop has been grown in the Portage La Prairie area of Manitoba. The widest fluctuations in production over the past three years occurred in Manitoba and Alberta.

Table 1.—Production of Field Peas (thousands of bushels) by Provinces in 1908 and at 5-Year Intervals from 1915 to 1955

Province	1908	1915	1920	1925	1930	1935	1940	1945	1950	1955
Canada	7,060	3,362	3,406	3,240	1,980	1,588	1,307	1,335	652	686
Prince Edward Island	14	3	8	4	4	*	*	*	*	*
Nova Scotia	21	4	38	10	14	*	*	*	*	*
New Brunswick	24	10	69	21	29	*	*	*	*	*
Quebec	675	432	1,225	616	539	317	290	118	66	60
Ontario	6,294	2,864	1,816	2,456	1,236	1,156	887	331	211	108
Manitoba	32	*	81	18	33	22	29	315	210	200
Saskatchewan	*	7	87	27	15	4	4	189	12	20
Alberta	*	8	29	30	18	11	19	247	94	242
British Columbia	*	41	52	58	92	78	82	135	59	56

* When acreage was below 1,000 acres, no yields were recorded.

Table 2.—Production of Field Peas (thousands of bushels) by Provinces, 1949 to 1958

Province	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958
Canada	772	652	744	888	1,210	880	686	1,817	1,400	1,146
Quebec	66	66	60	58	55	48	60	56	72	51
Ontario	303	211	154	144	202	140	108	127	143	133
Manitoba	200	210	343	460	777	450	200	1,168	840	700
Saskatchewan	44	12	28	27	18	19	20	72	45	41
Alberta	85	94	118	142	100	144	242	252	166	93
British Columbia	74	59	41	57	58	79	56	142	134	128

Many peas are produced under contract with dealers. Contracts are desirable for the following reasons:

(*a*) To encourage production of peas that have the good color and cookability demanded by a competitive market.

(*b*) To ensure a steady supply for a planned marketing program.

(*c*) To produce enough to keep marketing facilities in full operation.

To produce attractive, marketable peas for export or home consumption, whether for sale in packages or to canning factories, use seed guaranteed to be disease-free and without impurity. Canning factories take particular pride in their products. They will not accept immature or off-color peas, and will not buy peas that have been damaged in combining or threshing. If the threshing equipment is not properly adjusted for a continuous feed it may crack the seed coats. The result may be loss of a specialized market or dockage amounting to 2 or 3 per cent of the crop.

Rotations and Soils

Field peas are well adapted for growing in rotations. They usually follow a hoed crop or summerfallow, as they do not compete well with weeds. In

many areas peas are sown on clean wheat stubble that has been fall-plowed. Continuous cropping of peas on the same land increases the danger of introducing pea diseases and should not be practised. Well-drained clay-loam soil, of limestone origin, is considered the best type for peas. Soils rich in humus are likely to produce long vines rather than well-filled pods. Light, sandy soils, low in moisture, produce short vines and pods and generally lower yields. Good drainage is essential; on wet, soggy soils peas do not thrive and readily fall prey to root rot.

It is important that the soil warm up quickly in the spring to permit thorough working and early seeding. The crop then develops when ample moisture is present, and flowering and podding are generally well advanced before warmer July weather gets a chance to blast blossoms and reduce yields.

Fertilizers

Peas respond well to phosphate and potash fertilizers. They contain a high percentage of both phosphorus and potash and any deficiency of these elements in the soil should be remedied by applying such fertilizer. There are indications that peas grown on soils high in phosphate and potash may be easier to cook than those grown on soil low in these constituents. The nodules on the roots of the plant, with the help of nitrogen-fixing bacteria in the soil, can gather free nitrogen from the air and store it in the roots. Unfortunately these bacteria are not very active early in the spring, and to provide the necessary nourishment for rapid growth a small quantity of nitrogenous fertilizer applied at this time helps to give the pea crop a good start.

Seeding

Cultivate the land to seeding depth as early in the spring as possible. This cultivation helps to warm up the soil. Firm and level the seedbed to ensure even germination and uniform maturity. Rolling the field provides a smooth surface for machinery and buries loose stones that otherwise might be picked up in harvesting.

Use a regular grain drill for seeding field peas. On irrigated land sow the peas in double rows 24 to 36 inches apart, depending upon the length of the vines of the variety sown. To sow the peas in rows, cover the runs of the drill not needed. Use iron plates or block off the runs with pieces of stiff cardboard fitted into the openings. This space between the rows makes it easy for you to control weeds by cultivation up to the time of flowering. It also provides space for irrigation and, because the water in widely spaced rows does not come in contact with the plants, this space prevents scald in very warm weather.

The rate of sowing depends on the size of seed. Two bushels per acre is enough for Chancellor or peas of similar size. Medium-sized varieties such as Arthur, Creamette and Valley need 2½ to 3 bushels per acre. For large varieties like Stirling or Canadian Beauty, rates up to 4 bushels are not considered heavy.

Harrowing once or twice before the plants are 4 or 5 inches high will not lessen the crop. This cultivation breaks up the crust that forms on clay soils, especially after rain, and also kills weeds just starting to grow.

Harvesting

Do not harvest field peas till they are hard in the pod. The pods and vines should be brown and dry and should break if rubbed in the hand. To make shelling easier, cut the crop in the early morning or late afternoon when the plants contain more moisture. The most popular way to harvest them is by combining after or without swathing.

In small fields, the crop may be cut with a mower equipped with pea guards or pick-up fingers, which lift the vines before they reach the mower blades. The pick-up fingers should barely touch the ground and, with very heavy crops, may be placed 2 or 3 inches above the ground. Iron rods of uneven length attached behind the mower bar guide the mown peas in a windrow. The peas may be left in the windrow or piled in cocks to dry.

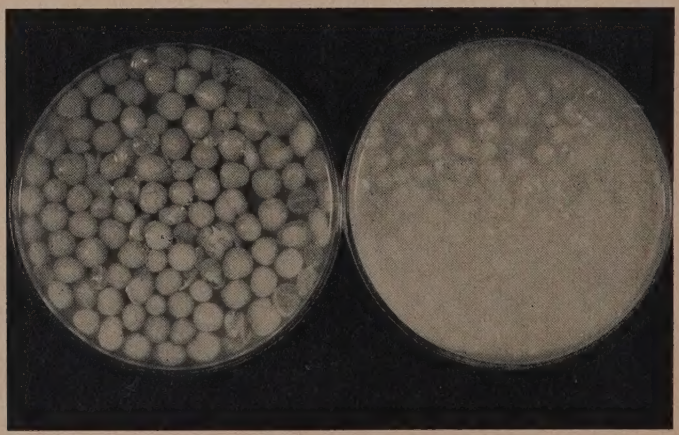
In either combining or threshing, feed the crop steadily and reduce the speed of the cylinder to 500 or 600 r.p.m. to prevent splitting the peas. To reduce the speed use a larger pulley on the cylinder and smaller pulleys on the wind and separator. In this way the speeds on the two latter sections will be maintained and separation and cleaning will be satisfactory. If the peas are very dry, lower or remove the concaves to prevent splitting. If the peas are damp, lower the concaves or remove some of the teeth. As augers also cause splitting, allow the peas to fall into a box below the elevator instead of lifting them in the usual way. A bucket elevator does not damage peas so badly as an auger.

If the crop is weedy, cut smaller swaths and so help to prevent the seed of immature weeds from plugging the combine.

Clean and grade peas as quickly as possible after harvesting because green weed seeds and other foreign material cause them to heat. The size of the screens used for cleaning peas varies with the size of the seed and the condition of the harvested crop. Generally, screens with round perforations of 18/64 to 24/64 inch are used on top. When cleaning Arthur and Valley, use a slotted screen, preferably one with an 11/64-inch slot on the bottom. When cleaning Chancellor or other small-seeded peas, use an 8/64-inch slot on the bottom. If there are many splits, a screen 11/64 or 8/64 by 3/4 inch (oat screen) is satisfactory.

Cooking Quality of Peas

After cooking for two hours, peas of good quality will disintegrate into a puree of fine consistency, and good flavor and color. The cooking quality depends on both variety and growing conditions. The photograph below shows samples of Arthur peas, grown in different locations, after being cooked for two hours.



Arthur peas after being cooked for two hours. Left, classed as a poor cooker. Right, classed as a good cooker.

The causes for the variable cooking quality of peas of the same variety are not fully understood. The quality is believed to be associated with the availability of soil phosphate, potash and moisture or, in fact, the general fertility level of the soil.

MARKETING

Most farmers deliver the crop as it comes from the combine or thresher and do no preliminary cleaning or docking. Those dealing with peas have their elevators well equipped to clean, grade and remove trash and broken or split peas before the crop is shipped to the ultimate market. Usually less than half the Canadian crop finds its way to the export market as whole peas, and a quarter is exported as split peas to special markets.

Commercial grades for peas grown in Western Canada are given in Table 3 and for those grown in Eastern Canada in Table 4.

VARIETIES

Most of the white- or yellow-seeded peas are used for soup. The five varieties recommended are described on pages 11 to 13, and photographs of the plants and seeds are given. Chancellor and Arthur are the most popular varieties. There is, however, a limited demand for the large Stirling pea for the split-pea market. The variety Valley is grown mainly in areas of the province of Quebec. Creamette, a new high-yielding, good-quality variety released in 1960, will probably replace Arthur.

Green or blue peas are also grown commercially, in limited amounts. They have failed to become popular in this country for the following reasons: demand for them is limited; certain climatic conditions cause seed bleach and to avoid this extra care at harvesting is necessary. Even these extra precautions often fail to produce the desired product. Plant breeders may be able to produce varieties with less seed bleach than Idabel, Early Blue, Alaska and Delwiche Scotch Green.

Table 3.—Commercial grades for peas grown in Western Canada

These definitions apply to recleaned and to processed peas

Grade Name	Standard of quality			Maximum limits of foreign material						
	Minimum weight per measured bushel in pounds	Minimum percentage of variety or type	Color	Content of peas of other color	Content of shriveled peas	Content of peas with cracked seed coats	Content of splits	Content damaged by insects	Content of other foreign material	Total content of splits, insect-damaged peas and other foreign material
No. 1 Canada Western	62	95	Good natural color	About 0.5%	About 1%	2%	About 0.5%	About 0.5%	Trace	About 1.5%
No. 2 Canada Western	60	90	Slightly off color	About 1%	3%	4%	About 1%	About 0.5%	0.5%	3%
No. 3 Canada Western	58	85	Fair color	2%	5%	8%	About 1.5%	About 1.5%	About 0.5%	5%
No. 4 Canada Western				3%	7%	10%	4%	4%	About 1%	10%
Sample Canada Western	Any peas that do not meet the requirements of other established grades									

NOTE: Peas of any type or variety may be graded according to the above definitions, and the commonly accepted commercial name or description or variety of such peas shall form part of the grade name, provided, however, that the use of a variety name in certifying to a grade of peas shall not imply any guarantee of varietal purity.

Table 4.—Commercial grades for peas grown in Eastern Canada

Grade name	Standard of Quality			Maximum limits of foreign material						
	Variety	Minimum weight per measured bushel in pounds	Minimum percentage of variety or type	Color	Content of peas of other color	Content of shriveled and cracked seed coats	Content of splits	Content of peas damaged by insects	Content of other foreign material	Total content of splits, insect-damaged peas and other foreign material
No. 1 Canada Eastern White.....	White	64	95	Good natural color	About 0.5%	About 2%	About 0.3%	About 0.5%	Trace	About 1%
No. 2 Canada Eastern White.....	White	62	90	Slightly off color	About 1%	5%	About 0.5%	About 0.5%	Trace	About 2%
No. 3 Canada Eastern White.....	White	60	80	Fair color	3%	10%	About 1.5%	About 1.5%	About 0.5%	5%
No. 4 Canada Eastern White.....	White	—	—	—	10%	15%	4%	4%	About 1%	10%
No. 1 Canada Eastern Marrowfat.	Marrowfat	64	95	Good natural color	About 0.5%	About 2%	About 0.3%	About 0.5%	Trace	About 1%
No. 2 Canada Eastern Marrowfat.	Marrowfat	62	90	Slightly off color	About 1%	5%	About 0.5%	About 0.5%	Trace	About 2%
No. 3 Canada Eastern Marrowfat.	Marrowfat	60	80	Fair color	3%	10%	About 1.5%	About 1.5%	About 0.5%	5%
No. 4 Canada Eastern Marrowfat.	Marrowfat	—	—	—	10%	15%	4%	4%	About 1%	10%

Table 4.—Commercial grades for peas grown in Eastern Canada—*Concluded*

Grade name	Standard of Quality			Maximum limits of foreign material						
	Variety	Minimum weight per measured bushel in pounds	Minimum percentage of variety or type	Color	Content of peas of other color	Content of shriveled and cracked seed coats	Content of splits	Content of peas damaged by insects	Content of other foreign material	Total content of splits, insect-damaged peas and other foreign material
No. 1 Canada Eastern Black Eye	Black Eye	64	95	Good natural color	About 0.5%	About 2%	About 0.3%	About 0.5%	Trace	About 1%
No. 2 Canada Eastern Black Eye	Black Eye	62	90	Slightly off color	About 1%	5%	About 0.5%	About 0.5%	Trace	About 2%
No. 3 Canada Eastern Black Eye	Black Eye	60	80	Fair color	3%	10%	About 1.5%	About 1.5%	About 0.5%	5%
No. 4 Canada Eastern Black Eye	Black Eye	—	—	—	10%	15%	4%	4%	About 1%	10%
No. 1 Canada Eastern Mixed.....	Any varieties mixed	64	—	Good natural color	—	About 2%	About 0.3%	About 0.5%	Trace	About 1%
No. 2 Canada Eastern Mixed.....	Any varieties mixed	62	—	Slightly off color	—	5%	About 0.5%	About 0.5%	Trace	About 2%
No. 3 Canada Eastern Mixed.....	Any varieties mixed	60	—	Fair color	—	10%	About 1.5%	About 1.5%	About 0.5%	5%
No. 4 Canada Eastern Mixed.....	Any varieties mixed	—	—	—	—	15%	4%	4%	About 1%	10%
Sample Canada Eastern	Any peas that do not meet the requirements of other established grades									

NOTE: Peas otherwise qualified for the grades of No. 1 or No. 2 Canada Eastern White, Marrowfat, or Black Eye but containing over 10 per cent of any other variety or varieties of the same color shall be graded according to quality as Canada Eastern Mixed Peas.

Arthur

ORIGIN: A selection made at the Central Experimental Farm from the cross Mummy and Multiplier.

DESCRIPTION: Stems medium-long, coarse, square or fasciated. Leaves medium-sized, lanceolate, light-green. Flowers white, numerous, mostly in a cluster or umbel at the tops of the stems. Pods straight, medium-sized. Peas medium to medium-large, yellow, round, generally slightly wrinkled. Maturing medium early. Yield fair to average. Weight per 1,000 kernels: 230 grams.

QUALITY: Highly prized for soup making.

DISTRIBUTION: Grown in most pea-growing areas in Canada, but mainly in Quebec, Ontario and Manitoba.

Chancellor

ORIGIN: A pure line selected at the Central Experimental Farm from an old variety of the same name.

DESCRIPTION: Stems medium-long, circular and fine. Leaves light-green, numerous, broadly lanceolate. Flowers white, borne axially, mostly 2 or 3 in a cluster. Pods short, straight, usually 4 or more peas to the pod. Seed small, yellow and smooth. Maturing early to medium early. Yield fair. Weight per 1,000 kernels: 134 grams. (Dash-away is similar to Chancellor in all respects.)

QUALITY: One of the principal varieties grown for soup.

DISTRIBUTION: One of the most widely grown varieties in Canada. Valuable in areas where the season is usually short.

Valley

ORIGIN: A selection from a cross (1187) made at the Central Experimental Farm in 1924 between Chancellor and Early Raymond.

DESCRIPTION: Stems circular, not fasciated as in Arthur. Leaves broadly lanceolate, medium-green. Flowers white, mostly borne in two's. Pods straight. Seed yellow, round and medium-sized, slightly smaller than Arthur. Maturing medium early, a few days after Chancellor. Yield reasonably good in most years. Weight per 1,000 kernels: 212 grams.

QUALITY: Satisfactory for soup.

DISTRIBUTION: Suitable in most pea-growing areas but most popular in Quebec.

Creamette

ORIGIN: A selection from the cross (Chancellor × Early Raymond) × Stirling (3884), made at the Central Experimental Farm in 1942.

DESCRIPTION: Stems circular, medium-long, indeterminate or of vine type. Leaves broadly lanceolate, medium-green; flowers white, mostly borne in pairs. Pods often slightly curved. Seed yellow, smooth, some slightly flattened. Maturing as early as Chancellor. Yield better than most varieties in many areas. Weight per 1,000 kernels: about 220 grams, or similar to Arthur.

QUALITY: Usually better than Arthur.

DISTRIBUTION: Licensed in February, 1960; initially 40 bushels of foundation seed distributed.

Stirling

ORIGIN: A selection made about 1927 by Mr. C. W. Stirling of Sidney, B.C., from an old variety of unknown origin.

DESCRIPTION: Stems long, circular, medium-fine in texture. Flowers white, mostly borne in two's. Leaves large, light-green with large shallow striations or indents. Pods large, nearly straight. Seed very large, round, yellow, some with slight wrinkles. Maturing a few days later than Chancellor. Yield slightly less than Chancellor. Weight per 1,000 kernels: 293 grams.

QUALITY: Good for soup. On a limited market a premium is sometimes paid for these large peas.

DISTRIBUTION: Mostly grown in British Columbia and the Ottawa Valley.

DISEASES

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Many diseases occur each year on field peas in Canada. Those discussed in the following section may become serious and affect the yield and quality of field peas. Brief descriptions of these diseases are given, together with control measures wherever possible.

There are several precautions that should be taken to prevent the introduction of a disease into a crop. The organisms that cause diseases of the pea are mainly present in seed or in the soil. To prevent the introduction of the seed-borne type such as the ascochyta diseases, use seed that is known to be free from disease organisms. You may also apply seed protectants. They are effective in three ways: they kill organisms on the surface of the seed; they protect the seed in the soil from fungi that might cause damping-off of the seedling, and they improve emergence. Chloranil (Spergon), 75 per cent captan (Orthocide 75, Captan 75-W, or equivalent), dichlone (Phygon), thiram (Arasan or equivalent), and methylmercury dicyandiamide (Panogen 15) are effective protectants.

Continuous cropping year after year tends to increase the soil-borne pathogens so practice crop rotation.

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THE ASCOCHYTA DISEASES

Three ascochyta diseases of peas are caused by three closely related fungi that produce distinct symptoms.

The most important one in Canada is leaf and pod spot (caused by *Ascochyta pisi* Lib.). The symptoms of the disease appear on the stems, leaves, and pods (Figures 1-4). Definite, sunken, tan to brown, circular spots appear on the leaves and pods. A dark-brown to purple margin often surrounds the spot. Stem lesions are usually present and, unlike the spots on the leaves, they are elongated rather than circular, and more sunken. In the centers of these spots very small amber to brown bodies ooze a pinkish mass of spores that are capable of starting fresh infections.

Another disease is mycosphaerella blight (caused by *Mycosphaerella pinodes* (Berk. & Blox.) Vestergr.). Irregular purple-brown spots appear on the leaves (Figure 5). The lack of a definite border distinguishes the spots of this disease from those of the leaf and pod spot disease. In the field, the disease is readily recognized by purple streaks, which start at the base of the stem and run up the plant. The pods may have small, brown to purple, irregular dots, which later form large purple areas. Purple streaks or spots are often prominent on the margins of the pods. On mature plants, late infections may cause gray, pitted pods and shriveled leaves.

A third disease is known as ascochyta foot rot (caused by *Ascochyta pinodella* L. K. Jones). The symptoms on the stem are similar to those produced by *Mycosphaerella pinodes*, but the spotting is more pronounced at the nodes. Spots are rare on the foliage and pods, but when they do occur they are irregular to circular and have no definite margin.

The fungi that cause these diseases are mainly seed-borne. They may also live on pea refuse and in the soil. However, seed-borne infection is probably the principal source of disease in succeeding crops.

Effective control of these diseases depends more on preventive than on curative measures. Use clean seed. Burn pea refuse; or if it must be plowed under, make sure it is buried deep. Practice a crop rotation of at least three years.

BACTERIAL BLIGHT

This disease (Figures 6 and 7) is caused by a bacterium (*Pseudomonas pisi* Sackett). The symptoms may appear on any of the above ground parts of affected plants. Infections start as small water-soaked spots on the leaves, stems, and pods. The spots on the leaves tend to be circular and on the pods elongated. A slimy, creamy-white exudate may appear on the surface of the spot. When this exudate dries the spot turns olive-brown and feels papery. Lesions on the pods may be circular, but they usually extend along the upper and lower sutures of the pod and are slightly sunken. The infection may extend into the seed.

The disease may be seed-borne and if the weather favors development of the disease the young seedling may be killed. The bacteria may also remain on old pea vines in the field and start new infections in the spring, so be sure your seed comes from pea fields known to be free from the disease.

FUSARIUM WILT

Fusarium wilt is caused by a fungus (*Fusarium oxysporum* Schlecht. f. *pisi* (Linford) Snyder & Hansen race 1). Symptoms usually appear on a few plants in a field or in one or more areas in a field. The lower leaves of infected plants turn yellow and the whole plant appears slightly stunted. Eventually the plant becomes pale-yellow and brittle. Plants infected in the seedling stage

may be killed, or if infected at a later stage may develop poorly filled pods. The fungus lives indefinitely in the soil. It enters through the roots into the conducting system of the stem. If the vine is sliced lengthwise near the soil line, a yellow to orange discoloration in the center of the tissue will be noticed. A disease known as near wilt, caused by a closely related organism, produces somewhat similar symptoms but the conducting tissue is brick-red and is discolored right up to the tip of the plant. Root-rotting organisms in the soil are usually associated with fusarium-wilted plants.

Once the wilt organism has infected the plant there is no way to control the disease. As the organisms live indefinitely in the soil, crop rotation is not effective. Use varieties such as Alaska or Arthur, which are almost completely resistant to wilt.

ROOT ROT

Root rot may occur on all underground parts of the pea plant and even on the stem a short distance above the surface of the soil. The lesions may be gray, black, or red and may form definite streaks on the stem near the soil line. The rot may start at the small feeding roots and progress to the main root, which it eventually destroys, leaving only a few shreds. In severe cases the affected plant may be pulled easily from the soil. When young seedlings are infected with root rot they usually die. Foliage symptoms are not noticeable in the early stages but an infected plant may appear yellow and stunted.

Root rot is caused by many different soil parasites that produce somewhat similar symptoms. After initial infection, secondary organisms attack the roots, and the original cause is hard to determine.

Once root rot has infected a plant there is no way of getting rid of it. Prevention is the best means of control. Seed treatment will protect seeds and seedlings during their early growth. Suitable fertilizers help the plants to be vigorous and healthy. Crop rotation prevents an extensive built-up of pathogenic organisms in the soil. As some of these fungi attack other crops as well, this practice is only partially successful. A well-drained location is desirable because moist conditions favor the development of root rot.

VIRUS DISEASES

A lot of attention should be given to this group of diseases because they are becoming increasingly important to pea production in Canada. Many virus diseases of peas are now recognized and in Canada pea mosaic, enation mosaic, pea streak, and pea stunt have been found.

Leaves with pea mosaic have mottled light- and dark-green spots (Figure 8). Enation mosaic also causes the leaves to be deformed and twisted. Pea streak causes a brown to purple streaking of stem and petiole, failure of pods to fill, and yellowing and wrinkling of the tips of the leaves.

Pea aphids are mainly responsible for the spread of these viruses, so you should spray or dust plants with malathion or parathion. Don't plant peas near other legumes such as clovers or alfalfa as the diseases may spread from these crops to peas. Destroy wild legumes growing near pea fields.

POWDERY MILDEW

This disease is caused by a fungus (*Erysiphe polygoni* DC.). It is favored by cool moist conditions and is widespread wherever peas are grown. White powdery areas appear on leaves, stems, and pods, and may cover the entire plant. Brown pitted spots may occur during severe epidemics, but infected plants rarely die.

Sulphur may be effective if applied at the first sign of the disease and every 10 days thereafter, but it is hardly worth the expense and trouble. The best control is to rotate crops, plow deep, and seed early.

SEPTORIA BLIGHT

Septoria blight (Figure 9) is caused by a fungus (*Septoria pisi* West.). It does little damage to peas but it is common enough to deserve description. On casual observation you might confuse it with the ascochyta leaf and pod spot; but on closer examination you will see that the spots on the leaves of plants that have septoria blight are at first yellow and indistinct, and gradually enlarge until the entire leaflet is covered. The disease may also spread to the pods and stems. Many small, black, pimple-like bodies are scattered throughout older spots. These bodies contain the spores that infect other plants.

OTHER DISEASES

Other diseases of peas such as rust (Figure 10), anthracnose, and downy mildew occur in Canada. However, they happen only now and then, and as a rule cause little damage to the crop.

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